TRANSFORMING MATERIAL HANDLING AT LOCKHEED MARTIN WITH COLLABORATIVE ROBOTICS

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Agenda

• What drove Lockheed Martin to invest in the most recent advancements in robotic technologies
• Lockheed Martin’s unique requirements and challenges
• Collaborative Robotics in the defense supply chain of the 21st century
• Flightline of the future
Autonomous Systems Roadmap

2015:
- SMSS
- ExoSkeleton
- AMAS/Apliquae'
- MULE
- F-35
- ROVER
- Stalker
- Indago
- KMAX
- FURY
- MAVEN
- Marlin USV
- Hybrid Air
- ARES
- USV

2025:

2035:

FIND YOUR WOW
Lockheed Martin Supply Chain Challenges

- Complex dynamic work environments
- Significant Security requirements
- Personnel Issues
  - Lack of qualified personnel who require significant training
  - Rising personnel cost (salary, benefits, etc.)
  - Personnel attrition
- Non-standardized warehouse processes
- Inventory validity issues
- Inconsistent and limited productivity
- Poor metrics definition capability
Flexibility Vs Productivity

2-3x productivity of cart picking at less than half the cost of traditional automation
We realized you can achieve comparable value to traditional automation by shrinking it down into on-demand services.
1. **INDUCT**
Cloud-based intelligent work allocation groups similar work to reduce associate walking between tasks.

2. **MEET**
Chuck eliminates the long walk by bringing the work directly to the associates in the active area.

3. **PICK**
Chuck leads the associate through their assigned tasks.

4. **TAKEOFF**
Chuck can sort exceptions from completed orders and deliver orders to different points across the warehouse. After job is completed, Chuck travels alone to the next destination and the associate badges into a new Chuck.

**How Chuck makes the task faster**
- Directed
- Lights
- Images
- Scanner
- Hands-free

Chuck follows a serpentine path as it moves through the assigned tasks.
Time To Benefit

Total Project Time to Payback (months)

- **CART**
  - 16 months

- **TRANSPORT ROBOT**
  - 23 months

- **CONVEYOR**
  - 46 months

- **6RS**
  - 18 months

- **GOODS-TO-PERSON**
  - 44 months

Legend:
- BUILDING
- DESIGN
- MFG
- DEPLOY
- PAYBACK

Months:

0 | 10 | 20 | 30 | 40 | 50
Introducing Chuck to Lockheed Martin

● Chuck is smart
  ○ Built from the same technology and sensors as autonomous vehicles
  ○ Uses machine learning and AI to help associates work faster
  ○ “Leads” associates through their work zones to minimize walking and to promote time on task
  ○ Integrates with WMS so it can be used in all put-away, pick, replenishment, and sorting tasks

● Chuck is agile
  ○ Doesn’t need wires, cables, or stickers to navigate the warehouse
  ○ Each unit is aware of its surroundings moving around boxes and racks and slowing down when people and equipment are in the area

● Chuck is a workhorse
  ○ Can run 24/7 with the latest battery technology for rapid charging
  ○ Can carry a max payload of 160 lbs.
  ○ Configurable to carry an array of carton and tote sizes
Implementation Outcomes

• Ease of installation
• Defined and standardized the supply chain process
• Rapid training and worker acceptance
• Increase of 16 to 77 LPH in 6 weeks (481%)
• ROI in 9 months with Estimated savings of $1.5M
• Demonstrated value cementing expansion to other USAF locations and programs
Flightline of the Future

- Aircraft Availability
- Sortie Generation
- Ground Operations
- A/C Repair
- Ownership Costs

Flightline Management/C2
- Ubiquitous COMMs
- Common Data and Modeling Infrastructure

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THANK YOU

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